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ABSTRACT

The Comprehensive School Mathematics Program (CSMP) is a program of CEMREL, Inc., one of the national educational laboratories, and was funded by the National Institute of Education (NIE). Its primary purpose is the development of curriculum materials for kindergarten through grade 6. This study compared CSMP and non-CSMP second-grade students' performance at two sites using a streamlined revision of the Mathematics Applied to Novel Situations (MANS) test. Twelve CSMP and nine non-CSMP classes were tested. Results showed that CSMP classes scored significantly higher at the .05 level on 7 of 13 scales. The best performances by program pupils was on measurements dealing with number relationships, mental arithmetic, and number fluency. There was no difference between CSMP and non-CSMP groups in computation scores. The findings are seen as corroborating more extensive prior testing results, except that two scales showed larger CSMP advantages. It is felt the results are also noteworthy because the simplification of the testing procedures should make them easier for districts to use. (MP)

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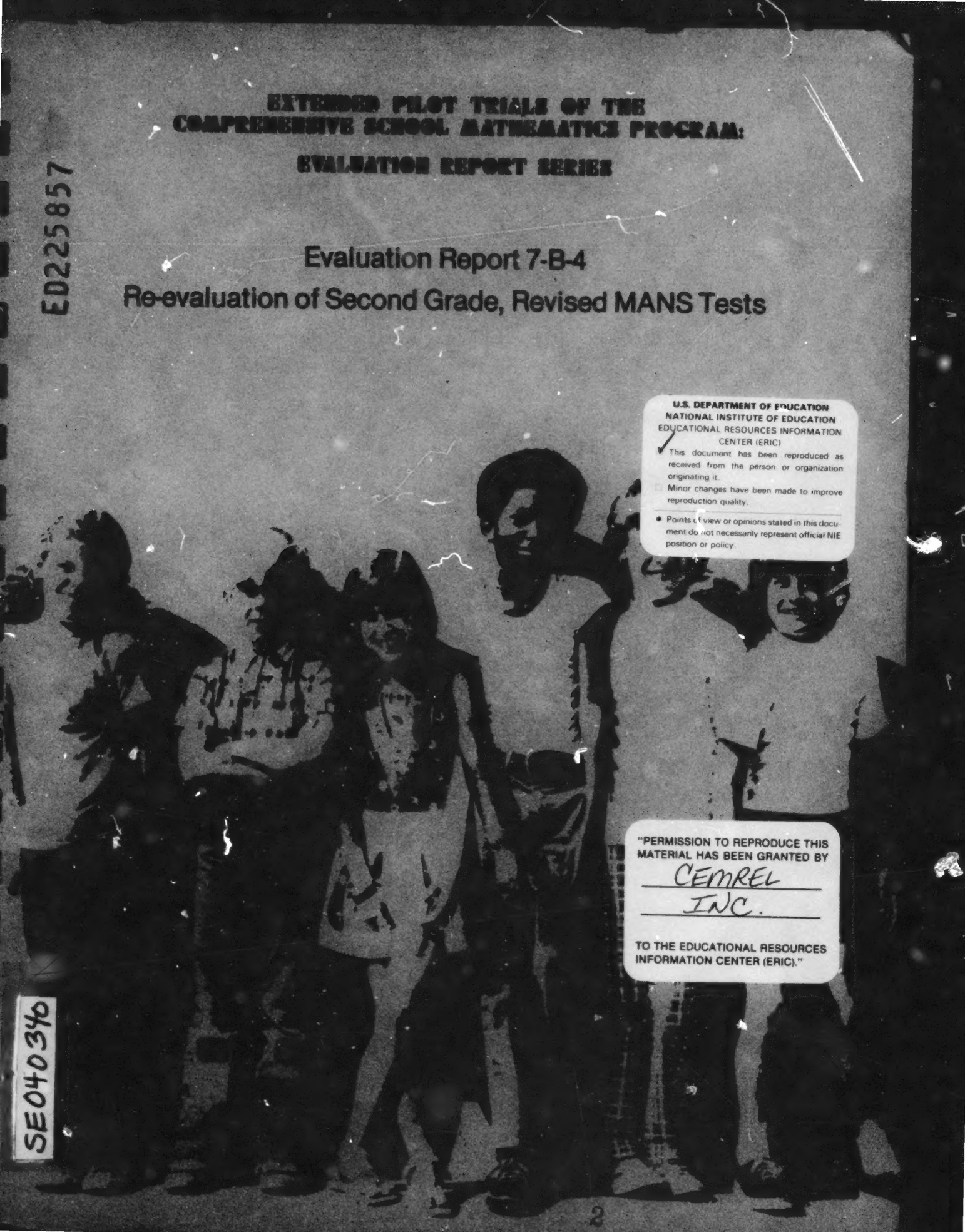
EXTENDED PILOT TRIALS OF THE COMPREHENSIVE SCHOOL MATHEMATICS PROGRAM:

EVALUATION REPORT SERIES

Evaluation Report 7-B-4
Re-evaluation of Second Grade, Revised MANS Tests



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Extended Pilot Trial of the Comprehensive School Mathematics Program

Evaluation Report 7-B-4
Re-evaluation of Second Grade, Revised MANS Tests

Martin Herbert

December, 1980

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Description of Evaluation Report Series

The Comprehensive School Mathematics Program (CSMP) is a program of CEMREL, Inc., one of the national educational laboratories, and is funded by the National Institute of Education. Its major purpose is the development of curriculum materials for grades K-6.

Beginning in September, 1973, CSMP began an extended pilot trial of its Elementary Program. The pilot trial is longitudinal in nature; students who began using CSMP materials in kindergarten or first grade in 1973-74, were able to use them in first and second grades respectively in 1974-75, and so on in subsequent years. Hence the adjective "extended".

The evaluation of the program in this extended pilot trial is intended to be reasonably comprehensive and to supply information desired by a wide variety of audiences. For that reason the reports in this series are reasonably non-technical and do not attempt to widely explore some of the related issues. The list of reports through year six is given on the next page. The following reports are planned for year 7:

7-B-1 - Fifth Grade Evaluation: Volume I, Summary
7-B-2 - Fifth Grade Evaluation: Volume II, Test Data
7-B-3 - Fifth Grade Evaluation: Volume III, Non-Test Data
7-B-4 - Re-evaluation of Second Grade, Revised MANS Tests
7-B-5 - Achievement of Former CSMP Students at Fourth Grade
7-B-6 - Student Achievement, Rapid Implementation Model

Extended Pilot Trials of the
Comprehensive School Mathematics Program

Evaluation Report Series

Evaluation Report 1-A-1	Overview, Design and Instrumentation
Evaluation Report 1-A-2	External Review of CSMP Materials
Evaluation Report 1-A-3	Final Summary Report Year 1
Evaluation Report 1-B-1	Mid-Year Test Data: CSMP First Grade Content
Evaluation Report 1-B-2	End-of-Year Test Data: CSMP First Grade Content
Evaluation Report 1-B-3	End-of-Year Test Data: Standard First Grade Content
Evaluation Report 1-B-4	End-of-Year Test Data: CSMP Kindergarten Content
Evaluation Report 1-B-5	Test Data on Some General Cognitive Skills
Evaluation Report 1-B-6	Summary Test Data: Detroit Schools
Evaluation Report 1-C-1	Teacher Training Report
Evaluation Report 1-C-2	Observations of CSMP First Grade Classes
Evaluation Report 1-C-3	Mid-Year Data from Teacher Questionnaires
Evaluation Report 1-C-4	End-of-Year Data from Teacher Questionnaires
Evaluation Report 1-C-5	Interviews with CSMP Kindergarten Teachers
Evaluation Report 1-C-6	Analysis of Teacher Logs
Evaluation Report 2-A-1	Final Summary Report Year 2
Evaluation Report 2-B-1	Second Grade Test Data
Evaluation Report 2-B-2	Readministration of First Grade Test Items
Evaluation Report 2-B-3	Student Interviews
Evaluation Report 2-C-1	Teacher Questionnaire Data
Evaluation Report 2-C-2	Teacher Interviews, Second Grade
Evaluation Report 2-C-3	Teacher Interviews, First Grade
Evaluation Report 3-B-1	Second and Third Grade Test Data Year 3
Evaluation Report 3-C-1	Teacher Questionnaire Data Year 3
Evaluation Report 4-A-1	Final Summary Report Year 4
Evaluation Report 4-B-1	Standardized Test Data, Third Grade
Evaluation Report 4-B-2	Mathematics Applied to Novel Situations (MANS) Test Data
Evaluation Report 4-B-3	Individually Administered Problems, Third Grade
Evaluation Report 4-C-1	Teacher Questionnaire Data, Third Grade
Evaluation Report 5-B-1	Fourth Grade MANS Test Data
Evaluation Report 5-B-2	Individually Administered Problems, Fourth Grade
Evaluation Report 5-C-1	Teacher Questionnaire and Interview Data, Fourth Grade
Evaluation Report 6-B-1	Comparative Test Data: Fourth Grade
Evaluation Report 6-B-2	Preliminary Test Data: Fifth Grade
Evaluation Report 6-C-1	Teacher Questionnaire Data: Grades 3-5

Key to Indexing

Evaluation Reports are labelled m-X-n,

where m is the year of the pilot study, with 1973-74 as Year 1.
X is the type of data being reported where A is for overviews and summaries, B is for student outcomes and C is for other data.
n is the number within a given year and type of data.

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Summary

This study compared CSMP and non-CSMP students' performance at two sites using a streamlined revision of the MANS Tests (Mathematics Applied to Novel Situations, intended to assess some of the underlying thinking skills of the CSMP curriculum without using any of its special vocabulary). A total of 21 classes were tested, 12 CSMP and 9 non-CSMP. The CSMP classes had studied the revised version of the CSMP curriculum.

On the total of the MANS Scales, CSMP classes averaged about 15% higher scores than non-CSMP, a difference which was significant at the .01 level.

On seven of the 13 individual scales, CSMP classes scored significantly higher at the .05 level. Their best performance was in scales dealing with number relationships, mental arithmetic and number fluency. They did slightly better in estimation and word problems. There was no difference in computation scores.

These findings corroborate the findings from the more extensive Extended Pilot Test, conducted prior to revisions, except that there were larger CSMP advantages in two of the individual scales. The findings are also noteworthy because the simplification of the testing procedures should make it easier for other districts to use these tests which remain, nevertheless, powerful enough to show various cognitive effects of the CSMP curriculum.

Introduction

The Comprehensive School Mathematics Program (CSMP) is a K-6 mathematics curriculum being developed and field tested by CEMREL, Inc. During the past few years, a special series of tests, the MANS Tests (Mathematics Applied to Novel Situations) has been developed for use in the evaluation of CSMP. This report presents two kinds of data.

a) Statistical data on a revised set of MANS scales

A series of 10 MANS scales was originally developed in 1976 for use in second grade in the CSMP Extended Pilot Test. Like all MANS scales they were intended to assess important mathematical thinking skills thought to underlie the CSMP curriculum, but in a novel context where possible and without using any of the special terminology and techniques of the CSMP curriculum. They required extensive directions and explanations, given in a standardized manner by specially trained testers. They were administered to 70 second grade classes, some CSMP and some non-CSMP classes, and the results of this experimental comparison are given in Evaluation Report 3-B-1.

Because of the expense and effort required to train testers, these scales have had limited utility outside the realm of CSMP Evaluation activities. In order to make them more widely available, these scales were revised in 1979-80. The primary objective was to simplify the directions enough that a local coordinator could fairly easily train a tester to carry out the testing. (Other revisions were also made based on statistical data from the original study and on new scales developed later in higher grades, but appropriate in concept for use with second graders.) These revised scales were denoted as the "Blue" Level, intended for second graders, but appropriate for certain first and third grade classes as well.

b) Evaluation data for CSMP second graders (used revised curriculum)

After the completion of the Extended Pilot Test for the second grade curriculum, final revisions were made in the curriculum, as in the case with other grade levels. Thus it is possible to compare the results of this study with those from the original Extended Pilot Test in order to determine whether the relative achievement of CSMP students has changed with the revised curriculum.

Setting

In May 1980, these scales were administered in three school districts. Two of the districts, District 1 and District 2, were small-city school districts, which had recently begun using CSMP in some of their schools.[1] In addition to the MANS data, the two districts provided reading scores, from district-administered tests as shown in Table 1. The third district, District 3, was a medium sized city in which only 3 classes participated and no reading scores were available.

Table 1

Participating Classes

District	Number of Classes		Average number of students per class		Mean Reading Score[1]	
	CSMP	non-CSMP	CSMP	non-CSMP	CSMP	non-CSMP
1	5	5	19	18	22.7	24.8
2	7	4	23	21	392	371
3	2	1	17	22	NA	NA

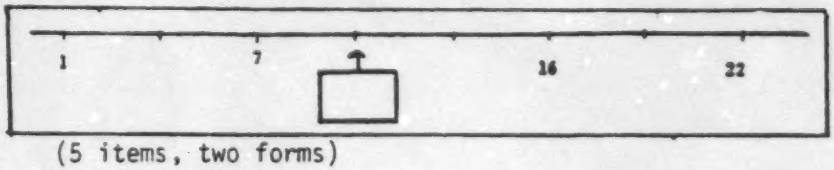
[1] For District 1: Raw Score, Vocabulary Test, Iowa Test of Basic Skills, Level 8, Form 7
For District 2: Standard Score, Total Reading, Comprehensive Test of Basic Skills, Level C, Form S

The MANS Scales and Summary Statistics Across Students

For each scale, brief directions and a sample item are given on the next pages. Also given are the number of items per form and some of the time limits. For a few scales, all students took the same form. But for most scales (those indicated by "x items, two forms"), each student took one of the two forms. For most scales, a flexible and sufficient amount of time was allowed. For a few scales, dealing with problems meant to be done without exact calculation, strict time limits were adhered to; for these particular scales, the allowed time has been shown.

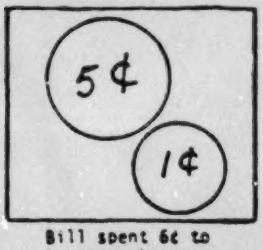
The statistics given are the means across all CSMP students and across all non-CSMP students, and the pooled standard deviation. Where there were two forms, there will be two rows of data, one for each form. There were about 290 CSMP students and 190 non-CSMP students, although where there were two forms only about half these numbers would have taken each form. An asterisk has been placed beside the means where the difference in mean scores is significant at the .05 level (using a simple t-test).

Appendix A gives the actual test items together with various item statistics. These also are based on students from all 25 classes. In the next section, an analysis of class means will be presented for those 21 classes on which a reading score was also available. This allowed the use of Analysis of Covariance procedures on the class means, a more appropriate (and conservative) method of analysis. Data from both methods are presented in this report (this section and next) and it is the case that they yielded virtually identical results as far as statistical significance is concerned.

	Mean Correct[1]		Standard
	CSMP	non-CSMP	Deviation
1. Which is Larger?			
Given two similar computation problems choose the one which gives the larger answer. Sufficient time to work out exact answers was not given; the larger answer could always be determined by inspecting the two problems.			
e.g. 585 + 250 ☐ 580 + 290 ☐ (Check the larger one)	5.3	5.0	2.0
	3.6	3.3	1.8
(9 items, two forms, time allowed = 3 minutes)			
2. Above or Below Zero			
Given the starting score (which could be above or below zero), and how much the score went up or down, determine the final score.			
e.g. Score at the start: 7 below zero; Then: Won 3; Score at the end? 10 below 4 below 4 above 10 above	1.8	1.5*	1.1
	2.3	2.1	1.1
(4 items, two forms)			
3. Labelling Number Lines			
Given a number line with some of the marks labelled, label the indicated mark (the intervals between marks varied from item to item and was never "1".	2.4	1.5 *	1.3
e.g. 	2.7	1.9 *	1.5
(5 items, two forms)			
4. Place Value			
a) Write a number that is read aloud b) Given a number, determine what number is 1, 10 or 100 larger or smaller than the number.			
e.g. What number is 10 more than 402? _____	7.8	5.7 *	4.1
	7.6	6.9	3.0
(11 items, two forms, but 5 items of type a) in common)			

[1] * = difference in mean scores significant at the .05 level.

	Mean Correct		Standard
	CSMP	non-CSMP	Deviation
5. Computation — Addition and subtraction - up to two digits Multiplication - basic facts (9 items, two forms)	6.7 6.7	6.8 6.7	2.0 2.0
6. Number Fluency Given sample number sentences about 9 (9 = 10 - 1, 9 = 1 + 5 + 3, 9 = 3 x 3, 9 = 18 ÷ 2) make up as many number sentences as you can about 8. (open ended, but a maximum of 16 were counted, common to both forms, time allowed = 4 minutes)	9.5	7.4 *	5.5
7. Sequences Determine the missing number in a given sequence of number e.g. 28, 25, ___, 19, 16, 13 (5 items, two forms)	4.1 3.5	3.7 * 2.9 *	1.6 1.7
8. Number Relations Given some pairs of numbers, determine the common relationship between the first and second number. e.g. David's Game: First clue: 5 → 10; Second clue 1 → 2; Third clue: 3 → 6; Question: 4 → □ (4 items, two forms)	1.8 1.8	1.4 * 1.4 *	1.2 1.4
9. Large Number Computation Put the number in the box which makes the number sentences true, where the box may be in any of the "3 positions" and where the numbers are large and easy-to-work with. e.g 3 x □ = 300; □ + 70 = 90 (12 items, two forms)	6.7 6.7	5.9 5.6 *	3.1 3.3

	Mean Correct		Standard
	CSMP	non-CSMP	Deviation
10. Word Problems Each problem has a series of cartoons illustrating the story, with a sentence below each cartoon, which sentence is also read to the students. e.g.  Bill spent 6¢ to buy some bananas. Bananas cost 2¢ each. How many bananas did he buy? _____ (8 items, common to both forms)	5.4	5.1	2.2
11-13. Estimating Intervals Given a computation problem, and 5 fixed intervals (0-10, 10-50, 50-100, 100-500, 500-1,000), determine which interval contains the answer to the problem, by putting an x in the interval. Students did not have time to compute exact answers.			
11. Addition e.g. 51 + 53 | 0 | 10 | 50 | 100 | 500 | 1000 (8 items, common to both forms, time allowed = 1½ minutes)	3.8	3.5	2.0
12. Subtraction e.g. 900 − 601 | 0 | 10 | 50 | 100 | 500 | 1000 (6 items, common to both forms, time allowed = 1½ minutes)	2.6	2.3	1.4
13. Multiplication e.g. 5 x 11 | 0 | 10 | 50 | 100 | 500 | 1000 (5 items, common to both forms, time allowed = 1½ minutes)	2.2	1.8 *	1.2

Analysis of Class Means

The following procedure was adopted for each MANS scale:

a) Only classes for which reading scores were available were used, i.e. the 21 classes in Districts 1 and 2. Individual students in these classes who did not have a reading score were eliminated from the study (usually less than one per class).

b) For the remaining students in each of the classes, two mean scores were calculated: the score on the particular MANS scale and the reading score for those students on whom that mean was based. (Where a MANS scale had two forms, the mean for that test was the sum of the means of the two forms).

c) Because different reading tests were used at each site, a formula was used to convert scores from District 1 to be comparable to those from District 2. This allowed a pooling of the data from the two sites.

d) An analysis of covariance procedure was then used with class means as the units of analysis and reading as the covariate, thus taking into account differences in the general ability level (as measured by reading scores) of the classes.

Table 2, below, summarizes the resulting data: mean raw scores across CSMP and across non-CSMP classes, mean scores adjusted for differences in reading ability for each of the two groups, and the significance of the difference. The two groups were very similar in reading ability so that the adjusted scores were almost identical to the raw scores.

Table 2

Summary of Class Means

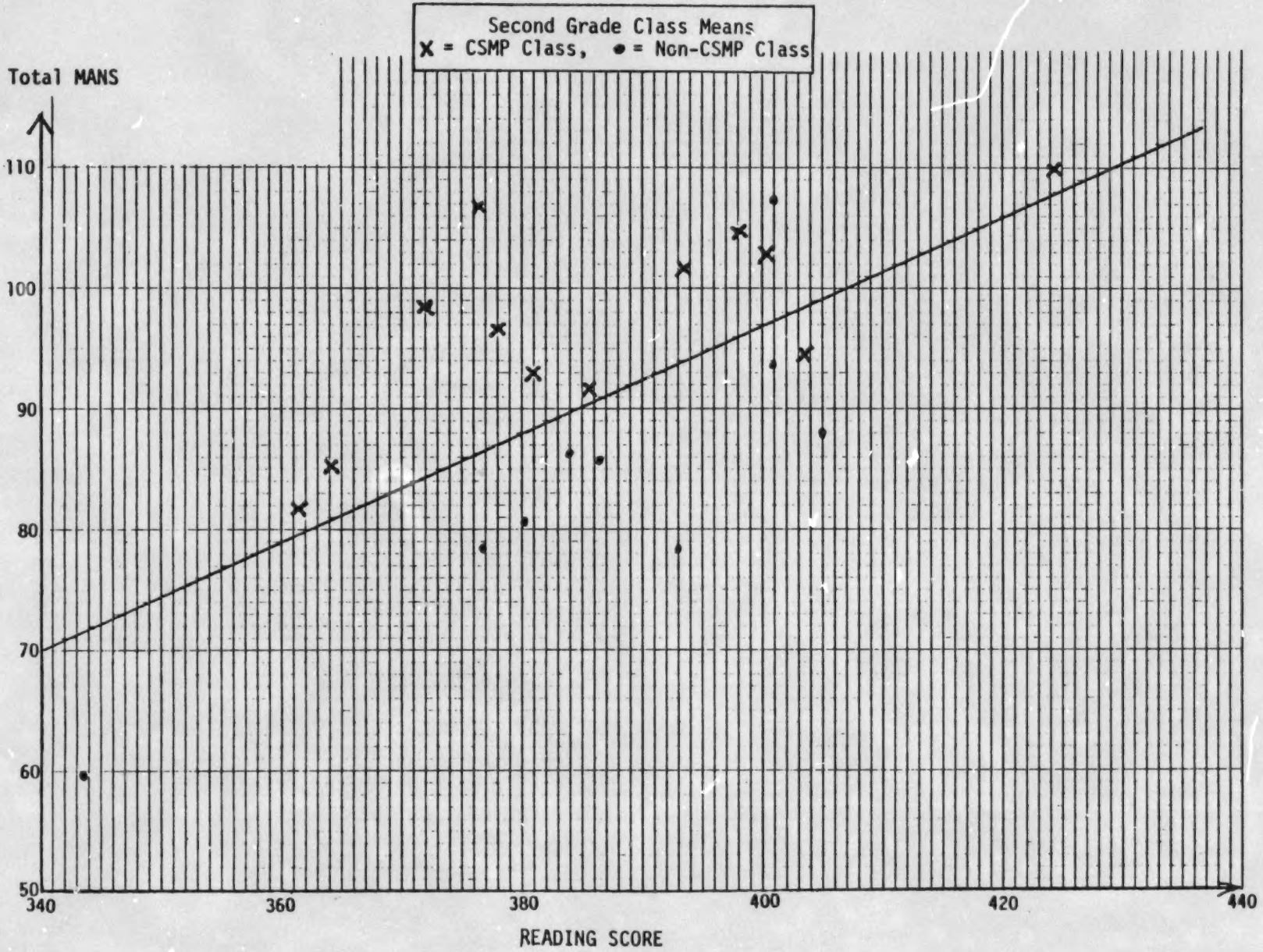
Scale[1]	Mean Raw Score		Mean Adjusted Scores		Level of Significance, less than[2]:
	CSMP Classes	Non-CSMP Classes	CSMP Classes	Non-CSMP Classes	
1. Which is Larger (18)	9.1	8.2	9.1	8.2	—
2. Above or Below Zero (8)	4.2	3.6	4.2	3.6	.10
3. Labelling Number Lines (10)	5.3	3.5	5.3	3.5	.01
4. Place Value (26)	15.7	13.1	15.6	13.2	.01
5. Computation (18)	13.6	13.7	13.5	13.7	—
6. Number Fluency (Max = 16)	10.0	7.8	9.9	7.9	.01
Reading Score, Tests 1-6	387	384			
7. Sequences (10)	7.8	6.9	7.9	6.9	.05
8. Number Relations (7)	3.7	2.7	3.7	2.7	.01
9. Large Number Computation (24)	13.6	11.8	13.6	11.8	.05
10. Word Problems (8)	5.5	5.1	5.5	5.1	—
11. Estimating Intervals-Add. (8)	3.8	3.6	3.8	3.6	—
12. Estimating Intervals-Sub. (6)	2.5	2.3	2.5	2.3	.10
13. Estimating Intervals-Mult. (5)	2.3	1.8	2.3	1.8	.01
Reading Score, Tests 7-13	386	387			
Total Reading Score, Total MANS	97.1 386	84.1 386	97.0	84.3	.01

[1] The number of items in each scale is shown in parentheses. Scales 1-6 were taken during a single session, and hence all share the same associated reading score. Similarly for Scales 7-13.

[2] Analysis of Covariance, F-Test, with 1 and 18 degrees of freedom. A dash (—) indicates $p > .10$, where p is the probability of obtaining a difference in mean scores this large if the two groups were actually the same from the same population. (i.e. no "real" differences).

On eight of the 13 tests, and on total MANS score, CSMP classes had significantly higher scores at the .05 level. Three were no significant differences in favor of the non-CSMP classes.

On the next page there is a graph of class means on which, for each classs, total score on the MANS tests is plotted against reading score. It can be seen from the regression line (which is the best overall predictor of MANS score from reading score based on all 21 classes) that the CSMP advantage is so clear that one hardly needs a test of statistical significance.


Second Grade Class Means
X = CSMP Class, • = Non-CSMP Class
Total MANS
110
100
90
80
70
60
50
340
360
380
400
420
440
READING SCORE

Comparison With Previous Results

In order to compare these results based on the revised curriculum, with those obtained in the Extended Pilot Test with the original MANS Test, a scale-by-scale comparison of p-values (with the tacit assumption that $p < .05$ is "significant") was made for scales which were roughly comparable. These similar scales have been grouped together in Table 3, below. One of the present scales and one of the previous scales (quite different from one another) are not shown because neither fits a particular category.

Table 3

Comparison of Present Results With Extended Pilot Trial Data, 1976
(Circled entries favor non-CSMP Classes, otherwise CSMP)

Category	Present Study: Scale	Present Study: p-value	Previous Study[1]: p-value (Scale Number)
Number Relations	7. Sequences	.05	.09 (A1)
	8. Number Relations	.01	.09 (A3)
	3. Labelling Number Lines	.01	.88 (B1)
	1. Which is Larger	.10	not given
Fluency	6. Number Fluency	.01	.19 (B2)
		not given	.43 (A2)
Estimation	11. Number Line Estimation - +	.40	
	12. " " " - −	.10	.23 (A4)
	13. - ×	.01	
Mental Arithmetic	9. Large Number Computation	.05	.01 (A5); .01 (B5)
	4. Place Value	.01	not given
Word Problems	10. Word Problems	.20	.08 (B3)
Computation	5. Computation	(.85)	.11; (.41); .11 (Local standardized data)

[1]These scales and the results shown are described in Evaluation Report 3-B-1.

The present results are very similar to those found previously. CSMP students are much better than non-CSMP students in Number Relations and Mental Arithmetic; somewhat better in Estimation and Word Problems, and no different in Computation. The only findings much different from the previous study are the improved performance of CSMP students on two scales: Labelling Number Lines (#3) and Number Fluency (#6), findings corroborated at higher grade levels. These improvements may very well be a result of the revision of the second grade curriculum.

Appendix A

The MANS Scales and Item Statistics

On the pages which follow, the items for each of the MANS scales are given, together with two statistics. In an oval beside the item are given two percentages; the first is the percent of CSMP students getting the answer correct and the second is the percent correct for non-CSMP students, e.g. (xx,yy).

Sample items and tester directions are not given, but for a few of the scales there are brief explanations for the reader's benefit.

Below is given the page number for each scale and KR20 reliability coefficient, which is a measure of homogeneity of the scale (or the degree to which the items are measuring the same thing). In parenthesis beside each coefficient is given the corrected KR20, an estimate of what the coefficient would have been if there had been 12 items in the scale. Thus, the corrected reliabilities of the various scales can be more realistically compared.

MANS Scale	Page	Number[1] of Items	KR20 Reliability Form 1	Form 2
1. Which is Larger	18	9,9	.58(.65)	.49(.56)
2. Above and Below Zero	20	4,4	.50(.75)	.25(.38)
3. Labelling Number Lines	22	5,5	.57(.76)	.63(.80)
4. Place Value	24	11,11	.86(.87)	.84(.85)
5. Computation	26	9,9	.71(.77)	.72(.77)
6. Number Fluency	28	16		
7. Sequences	30	5,5	.82(.92)	.81(.91)
8. Number Relations	32	4,4	.57(.80)	.70(.88)
9. Large Number Computation	34	12,12	.80(.80)	.85(.85)
10. Word Problems	36	8	.72(.79)	
11. Estimating Intervals - Add.	38	8	.65(.74)	
12. " " - Sub.	39	6	.47(.64)	
13. " " - Mult.	40	5	.42(.63)	

[1]When two numbers are given, there are two forms of the scale.

Test 1, Which is Larger

(Check the box for the larger one, or check both boxes if they're equal.)

Form 1

ADDITION

67 + 50 ☐
68 + 40 ☐ (65,63)

6,008 + 1 ☐
6,080 + 1 ☐ (65,51)

685 + 250 ☐
580 + 290 ☐ (74,73)

62 + 50 ☐
61 + 60 ☐ (66,64)

SUBTRACTION

5,190 - 1 ☐
5 209 - 1 ☐ (56,63)

149 - 75 ☐
149 - 80 ☐ (39,32)

861 - 570 ☐
860 - 470 ☐ (31,26)

MULTIPLICATION

3 x 31 ☐
31 x 3 ☐ (66,67)

$\frac{1}{2}$ x 450 ☐
$\frac{1}{2}$ x 250 ☐ (71,63)

Test 1, continued

Form 2

ADDITION

230 + 91
225 + 91 □□ (75,73)

173 + 174
172 + 175 □□ (62,51)

270 + 240
275 + 210 □□ (49,49)

478 + 369
678 + 169 □□ (25,21)

SUBTRACTION

5,187 - 1
5,222 - 1 □□ (42,43)

820 - 470
830 - 670 □□ (17,30)

705 - 62
704 - 61 □□ (26,20)

MULTIPLICATION

4 x 101
3 x 102 □□ (38,33)

$\frac{1}{2}$ x 396
$\frac{1}{3}$ x 396 □□ (22,10)

Test 2, Above and Below Zero.

Form 1

Mary Score at the start: 6 above zero
Then: Lost 2
Score at the end?
8 above 4 below 4 above 8 above

42,33

Peter Score at the start: 7 below zero
Then: Won 3
Score at the end?
10 below 4 below 4 above 10 above

32,21

Ann Score at the start: 3 below zero
Then: Lost 4
Score at the end?
7 below 1 below 1 above 7 above

29,19

Sam Score at the start: zero
Then: Won 8
Score at the end?
8 below zero 8 above 80 above

81,75

Test 2, continued

Form 2

John Score at the start: 4 below zero
Then: Won 6
Score at the end?

10 below 2 below 2 above 10 above

31,33

Sally Score at the start: 5 above zero
Then: Lost 7
Score at the end?

12 below 2 below 2 above 12 above

75,70

Hank Score at the start: 1 above zero
Then: Won 5
Score at the end?

6 below 4 below 4 above 6 above

71,66

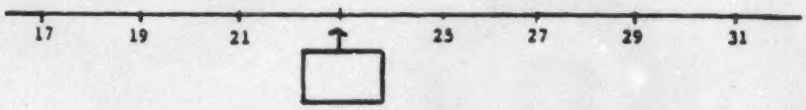
Helen Score at the start: zero
Then: Lost 9
Score at the end?

zero 9 below 9 above 90 above

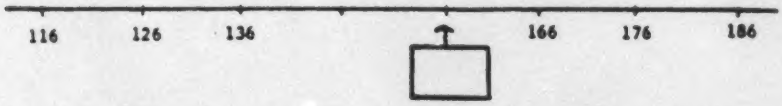
50,44

Test 3, Labelling Number Lines

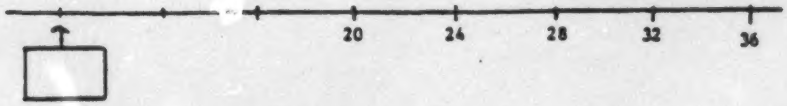
Form 1



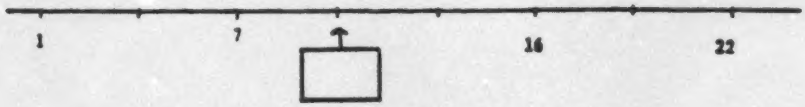
79,68



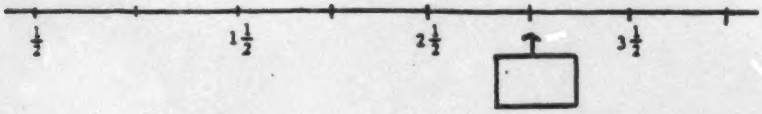
65,46



45,13



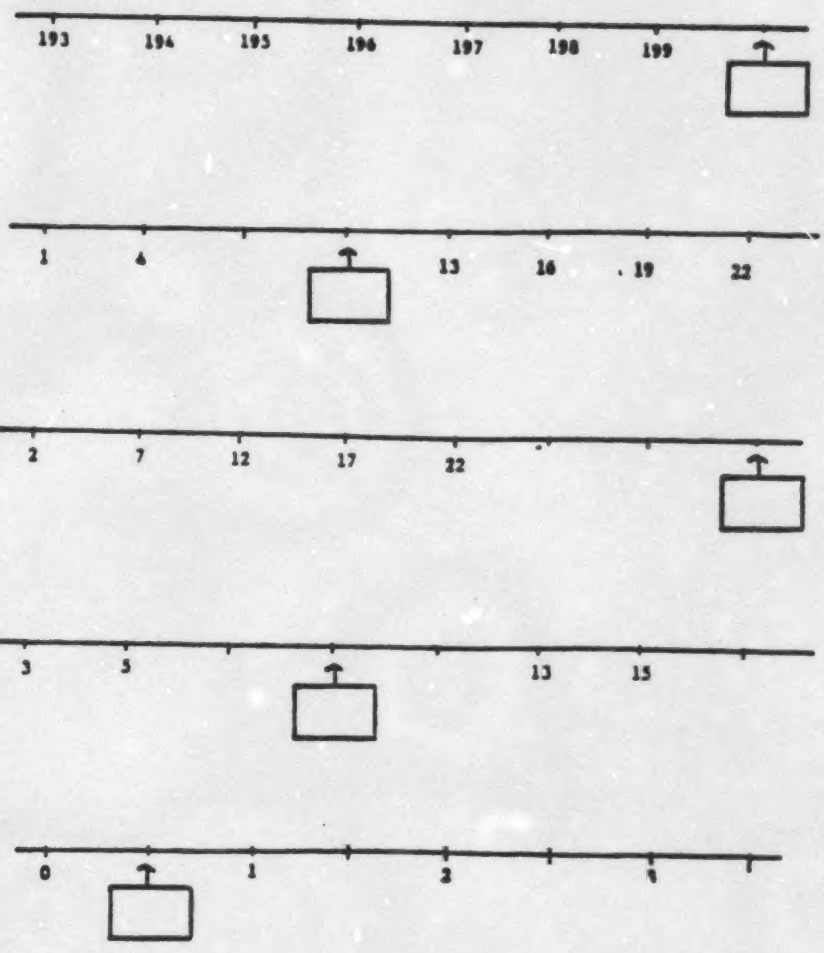
37,16



09,03

Test 3, continued

Form 2



Test 4, Place Value

(For A to F, students had to write the number which the tester said aloud; these are shown in parentheses.)

A. (491) _____ 89,79

B. (512) _____ 88,76

C. (207) _____ 89,76

D. (820) _____ 88,74

E. (1008) _____ 70,55

F. (7065) _____ 58,41

What number is 10 more than 402? _____ 64,38

What number is 100 more than 601? _____ 63,48

What number is 1 more than 999? _____ 56,45

What number is 10 more than 495? _____ 28,16

What number is 100 more than 901? _____ 45,29

Test 4, continued

Form 2

A. (491) _____ 91,74

B. (512) _____ 89,77

C. (207) _____ 92,79

D. (820) _____ 91,76

E. (1008) _____ 59,53

F. (7065) _____ 51,33

What number is 10 more than 247? _____ 41,42

What number is 100 more than 481? _____ 52,50

What number is 1 more than 99? _____ 90,92

What number is 10 more than 900? _____ 50,56

What number is 100 more than 900? _____ 50,53

Test 5, Computation

Form 1

ADDITION

6 +9	4 7 0 +5	62 +13	46 +29
(91,91)	(84,86)	(93,96)	(73,64)

SUBTRACTION

11 -5	76 -44	73 -8
(74,78)	(76,86)	(36,44)

MULTIPLICATION

1 x 5 = (73,74) 3 x 4 = (70,58)

Test 5, continued

Form 2

ADDITION

8 +7	19 +6	5 43 +36	124 +305
(93,94)	(82,85)	(69,73)	(58,89)

SUBTRACTION

14 -7	49 - 7	679 -338
(77,69)	(69,70)	(70,80)

MULTIPLICATION

4 x 2 = (77,68) 5 x 8 = (40,43)

Test 6, Number Fluency

(Since this was open ended, percentage figures cannot be given.)

Number Sentences

Mary's number sentences about 9.

$9 = 10 - 1$ $\qquad$ $9 = 3 \times 3$

$9 = 1 + 5 + 3$ $\qquad$ $9 = 18 + 2$

My number sentences about 8.

8 = _____ $\qquad$ 8 = _____

8 = _____ $\qquad$ 8 = _____

8 = _____ $\qquad$ 8 = _____

8 = _____ $\qquad$ 8 = _____

8 = _____ $\qquad$ 8 = _____

8 = _____ $\qquad$ 8 = _____

8 = _____ $\qquad$ 8 = _____

8 = _____ $\qquad$ 8 = _____

Test 7, Sequences

Form 1

12, 11, 10, ___, 8, 7 (92,86)

5, 7, ___, 11, 13, 15 (85,80)

76, 66, 56, 46, ___, 26, 16 (80,74)

28, 25, ___, 19, 16, 13 (76,59)

8, $8\frac{1}{2}$, 9, ___, 10, $10\frac{1}{2}$, 11 (73,67)

Test 7, continued

Form 2

14, 12, 10, ___, 6, 4 (82,68)

1, 5, ___, 13, 17, 21 (73,53)

40, 35, 30, ___, 20, 15, 10 (73,56)

50, 100, 150, ___, 250, 300, 350 (65,56)

1, $1\frac{1}{2}$, 2, ___, 3, $3\frac{1}{2}$, 4 (61,55)

Test 8, Number Relations

(Use the three clues to figure out what the student's game is, and then answer the question.)

Form 1

Ann's Game

	Class said:	Ann's answer:
First clue:	6	3
Second clue	4	1
Third clue:	8	5
Question:	1	☐

25,07

Bob's Game

	Class said:	Bob's answer:
First clue:	5	7
Second clue:	2	4
Third clue:	8	10
Question:	3	☐

62,48

Cindy's Game

	Class said:	Cindy's answer:
First clue:	5	10
Second clue:	2	7
Third clue:	1	6
Question:	4	☐

64,57

David's Game

	Class said:	David's answer:
First clue:	5	10
Second clue	1	2
Third clue:	3	6
Question:	4	☐

33,23

Note, the first problem, Ann's Game, contained an error. The last line should have been 3 ☐ instead of 1 ☐. With the error, the correct answer is negative 2. This scale was not intended to use negative numbers but it inadvertantly happened on this item.

Test 8, continued

Form 2

Ellen's Game

	Class said:	Ellen's answer:
First clue:	8	6
Second clue:	3	1
Third clue:	5	3
Question:	2	

41,41

Fred's Game

	Class said:	Fred's answer:
First clue:	4	7
Second clue:	1	4
Third clue:	6	9
Question:	2	

58,43

Greg's Game

	Class said:	Greg's answer
First clue:	5	4
Second clue:	3	2
Third clue:	9	8
Question:	7	

55,41

Helen's Game

	Class said:	Helen's answer:
First clue:	2	1
Second clue:	8	4
Third clue:	10	5
Question:	6	

27,15

Test 9, Large Number Computation

Form 1

$20 + 10 = \square$ (96,89)

$\square + 120 = 220$ (54,47)

$\square + 70 = 90$ (66,65)

$500 + 500 = \square$ (65,63)

$70 - 40 = \square$ (68,71)

$423 - 422 = \square$ (45,40)

$\square - 200 = 100$ (42,54)

$300 - \square = 250$ (22,22)

$3 \times 20 = \square$ (42,41)

$3 \times \square = 300$ (56,37)

$\square \times 4 = 8$ (60,46)

$\frac{1}{2} \times 10 = \square$ (54,15)

Test 9, continued

Form 2

$40 + 60 = \square$ (79,80)

$50 + 150 = \square$ (51,56)

$50 + \square = 70$ (71,75)

$35 + \square = 65$ (38,35)

$600 - 100 = \square$ (74,66)

$90 - \square = 60$ (62,58)

$\square - 49 = 0$ (73,69)

$\square - 150 = 50$ (24,18)

$2 \times 400 = \square$ (73,41)

$\square \times 7 = 14$ (46,30)

$10 \times \square = 90$ (49,29)

$\frac{1}{2} \times \square = 100$ (25,05)

Test 10, Word Problems

(Tester read the problems aloud while students read along silently and looked at the pictures.)

1.

David had 11 marbles in his bag.

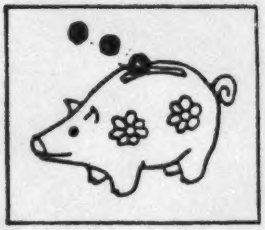
He lost 6 marbles.

How many marbles does David have now?

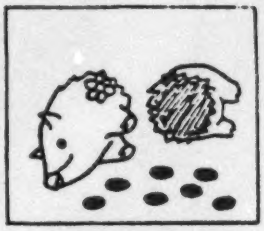
_____

88,92

2.



Mary's father added 3¢ to her piggy bank.



Then Mary broke her piggy bank and found 7¢.

How much was in the piggy bank to start with?

_____

61,63

3.

4 children earned $12 together

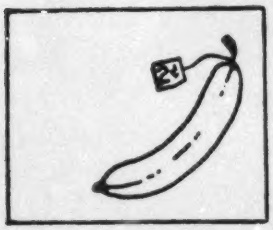
They shared the money equally.

How much did each child get?

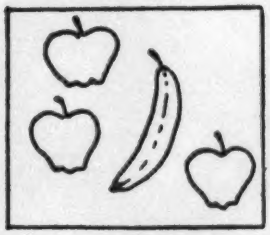
_____

61,52

4.



Apples cost 5¢ each and bananas cost 2¢ each.



Sally buys 3 apples and 1 banana.

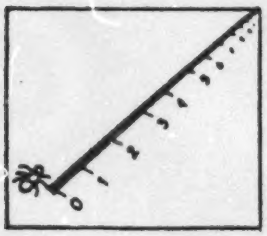
How much does it cost altogether?

_____

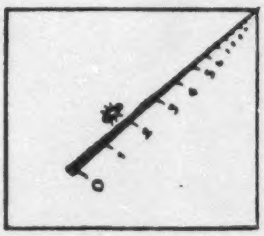
63,61

Test 10, continued

5.



A fantastic ant is starting a trip.



After one day the ant had gone 2 miles.

At that same speed, how far would he be after 5 days?

40,39

6.

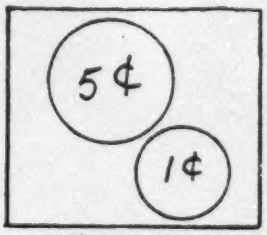
Mr. Rich lost 100 dollars.

He still had 200 dollars left.

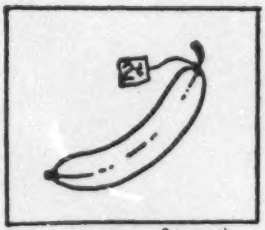
How much did Mr. Rich start with?

77,71

7.



Bill spent 6¢ to buy some bananas.

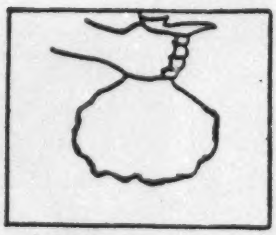


Bananas cost 2¢ each.

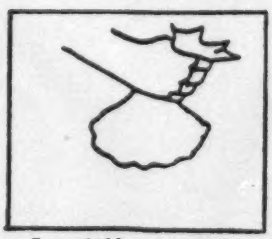
How many bananas did he buy?

64,60

8.



Bill started with 40 pennies.



Then Bill spent half his pennies.

How many pennies did he have left?

84,72

Test 11, Estimating Intervals - Addition

(To show which two numbers the answer lies between, mark an "x" anywhere between those numbers.)

ADDITION

9 + 19	0	10	50	100	500	1000	81,71
41 + 41 + 41	0	10	50	100	500	1000	47,47
23 + 19	0	10	50	100	500	1000	51,54
270 + 270	0	10	50	100	500	1000	55,51
51 + 53	0	10	50	100	500	1000	47,40
29 + 29	0	10	50	100	500	1000	41,44
189 + 273	0	10	50	100	500	1000	28,23
9 + $\frac{1}{2}$	0	10	50	100	500	1000	30,23

40

Test 12, Estimating Intervals - Subtraction

(See Test 11)

SUBTRACTION

90−12	0	10	50	100	500	1000	65,59
105 − 8	0	10	50	100	500	1000	61,58
900 − 601	0	10	50	100	500	1000	46,42
71 − 69	0	10	50	100	500	1000	12,16
100 − 65	0	10	50	100	500	1000	37,24
990 − 110	0	10	50	100	500	1000	35,32

41

MULTIPLICATION

3 x 21	0	10	50	100	500	1000	62,53
2 x 209	0	10	50	100	500	1000	52,46
5 x 11	0	10	50	100	500	1000	49,48
3 x 211	0	10	50	100	500	1000	36,25
$\frac{1}{2}$ x 15	0	10	50	100	500	1000	25,08

Appendix B
Mean Scores by Site

Table A, next page, shows the mean scores across CSMP and non-CSMP classes in each site for the various MANS scales. Also given are the adjusted means for each site but it should be noted that these two studies were done independently, using whatever reading score was used in the district. Thus adjusted means are adjusted with respect to the other curriculum group, but independently of the other site. Hence one can compare adjusted means within a site, but not from one site to another.

Table A

Mean Scores by Site

Test	District 1				District 2			
	Raw Score Means		Adjusted Means		Raw Score Means		Adjusted Means	
	CSMP (n=5)	Non-CSMP (n=5)	CSMP	Non-CSMP	CSMP (n=7)	Non-CSMP (n=4)	CSMP	Non-CSMP
Test 1, Which is Larger	9.2	8.3	9.6	7.9	9.0	8.0	8.8	8.2
Test 2, Above and Below Zero	3.7	3.6	3.9	3.4	4.6	3.6	4.4	3.8
Test 3, Labelling Number Lines	5.3	3.6	5.5	3.4	5.3	3.4	5.1	3.6
Test 4, Place Value	16.2	14.3	16.6	13.9	15.3	11.7	14.8	12.2
Test 5, Computation	13.6	15.2	14.1	14.6	13.6	11.8	13.3	12.1
Test 6, Number Fluency	9.5	8.9	10.4	7.9	10.3	6.4	10.1	6.6
Reading[1]	22.9	24.5			393	371		
Test 7, Sequences	7.7	7.4	7.9	7.2	7.9	6.2	7.5	6.6
Test 8, Number Relations	3.6	3.1	3.6	3.1	3.8	2.4	3.6	2.6
Test 9, Large Number Computation	13.6	13.3	14.6	12.4	13.6	10.0	12.6	11.0
Test 10, Word Problems	5.4	5.0	5.6	4.8	5.6	5.2	5.4	5.5
Test 11, Estimating Intervals-Add.	3.3	3.7	3.6	3.4	4.2	3.5	4.0	3.7
Test 12, Estimating Intervals-Sub.	2.4	2.4	2.5	2.3	2.6	2.1	2.5	2.2
Test 13, Estimating Intervals-Mult.	2.0	1.9	2.1	1.8	2.4	1.7	2.4	1.8
Reading[1]	22.8	24.9			391	372		
Total MANS	95.5	90.7	100.1	86.1	98.3	75.9	94.3	79.0
Reading[1]	22.8	24.7			392	372		

[1]These are the mean reading scores across classes, based on students present on the day of administration of the tests listed immediately above. In District 1, this is the raw score, Vocabulary Test, Iowa Tests of Basic Skills, Level 8. In District 2, this is the standard score, Total Reading, Comprehension Test of Basic Skills, Level C.